

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1- 45 (Canceled)

46. (Previously Presented) A process for forming a metal film on at least one surface of a diffusion barrier layer comprising tungsten nitride, the process comprising:

providing at least one surface of the diffusion barrier layer wherein the at least one surface comprises a stoichiometric amount or greater of nitrogen relative to tungsten contained therein and wherein the at least one surface is comprised of an orientation selected from the group consisting of a (111) preferred orientation and a (100) preferred orientation; and

forming the metal film via a chemical vapor deposition process on the at least one surface using at least one organometallic precursor comprising copper.

47. (Canceled)

48. (Canceled)

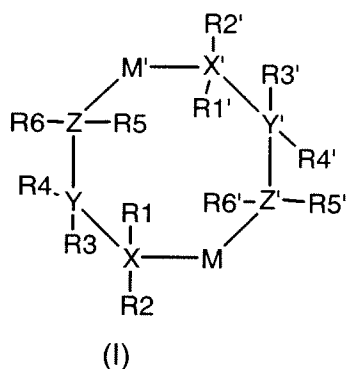
49. (Previously Presented) The process of claim 46 wherein the at least one surface is comprised of non-stoichiometric tungsten nitride having a greater amount of nitrogen atoms than tungsten atoms contained therein.

50. (Canceled)

51. (Previously Presented) The process of claim 46 wherein the chemical vapor deposition is at least one process selected from the group consisting of thermal chemical vapor deposition, plasma enhanced chemical vapor deposition, remote plasma enhanced chemical vapor deposition, plasma assisted chemical vapor deposition, cryogenic chemical vapor deposition, chemical assisted vapor deposition, hot-filament chemical vapor deposition, photo-initiated chemical vapor deposition, and combinations thereof.

52. (Previously Presented) The process of claim 46 wherein the at least one organometallic precursor comprises
1,1,1,5,5,5-hexafluoro-2,4-pentanedionato-copper (I) trimethylvinylsilane.

53. (Previously Presented) The process of claim 46 wherein the at least one organometallic precursor comprises a compound represented by the following structure:



wherein M and M' are Cu;

X and X' are each N or O;

Y and Y' are each Si, C, Sn, Ge, B, or Al;

Z and Z' are each C, N, or O; R1, R2, R1', and R2' are each independently a hydrogen, an alkyl, an alkenyl, an alkynyl, a partially fluorinated alkyl, an aryl, an alkyl-substituted aryl, a partially fluorinated aryl, a fluoralkyl-substituted aryl, a trialkylsilyl, or a triarylsilyl when X and X' are N;

R1 and R1' are each independently an alkyl, an alkenyl, an alkynyl, a partially fluorinated alkyl, an aryl, an alkyl-substituted aryl, a partially fluorinated aryl, a fluoralkyl-substituted aryl, a trialkylsilyl, or a triarylsilyl when X and X' are O;

R3, R4, R3', and R4' are each independently a hydrogen, an alkyl, a partially fluorinated alkyl, a trialkylsilyl, a triarylsilyl, a trialkylsiloxy, a triarylsiloxy, an aryl, an alkyl-substituted aryl, a partially fluorinated aryl, a fluoroalkyl-substituted aryl, or an alkoxy; and

R5, R6, R5', and R6' are each independently a hydrogen, an alkyl, an alkenyl, an alkynyl, a partially fluorinated alkyl, an aryl, an alkyl-substituted aryl, a partially fluorinated aryl, a fluoralkyl-substituted aryl, a trialkylsiloxy, a triarylsiloxy, a trialkylsilyl, a triarylsilyl, or an alkoxy;

provided that when X and X' are each O, there is no substitution at R2 and R2';

further provided that when Z and Z' are each N, there is no substitution at R6 and R6';

further provided that when Z and Z' are each O, there is no substitution at R5, R6, R5', or R6';

said alkyl and alkoxide having 1 to 8 carbons; said alkenyl and alkynyl having 2 to 8 carbons; and said aryl having 6 carbons.

54. (Previously Presented) The process of claim 46 wherein the metal film is a seed layer.

55. (Previously Presented) A process for forming a substantially continuous copper film on a surface of a tungsten nitride diffusion barrier layer, the process comprising the steps of:

providing a substrate comprising the surface of the diffusion barrier layer wherein the surface is selected from a non-stoichiometric surface comprising a lesser amount of nitrogen atoms than tungsten atoms contained therein, an amorphous surface, a polycrystalline surface, a stoichiometric surface having a preferred orientation other than a (100) orientation, a stoichiometric surface having a preferred orientation other than a (111) preferred orientation, and combinations thereof;

exposing the surface of the diffusion barrier layer to an at least one adhesion promoting agent comprising nitrogen; and

forming the copper film on at least a portion of the surface using an organometallic copper precursor

wherein at least a portion of the exposing step is conducted prior to the forming step.

56. (Previously Presented) The process of claim 46 wherein the at least one surface is comprised of the (111) preferred orientation.

57. (Previously Presented) The process of claim 46 wherein the at least one surface is comprised of the (100) preferred orientation.

58. (Previously Presented) The process of claim 55 wherein the surface is the non-stoichiometric surface comprising a lesser amount of nitrogen atoms than tungsten atoms contained therein.
59. (Previously Presented) The process of claim 55 wherein the surface is amorphous.
60. (Previously Presented) The process of claim 55 wherein the surface is polycrystalline.
61. (Currently Amended) A process for forming a substantially continuous metal film on a surface of a diffusion barrier layer, the process comprising:
- depositing the diffusion barrier layer onto a substrate wherein the surface of the diffusion barrier layer is comprised of at least one material selected from a stoichiometric tungsten nitride with a (100) preferred orientation, a stoichiometric tungsten ~~nitride~~ nitride with a substantially (111) preferred orientation, a stoichiometric tungsten nitride with a (111) preferred orientation, a stoichiometric tungsten nitride which is amorphous, a stoichiometric tungsten nitride which is polycrystalline, a non-stoichiometric tungsten nitride having a greater amount of nitrogen atoms than tungsten atoms contained therein, and a mixture thereof; and
- forming the metal film on at least a portion of the surface using an at least one organometallic precursor.
62. (Previously Presented) The process of claim 61 wherein the surface is comprised of stoichiometric tungsten nitride with a (100) preferred orientation.
63. (Previously Presented) The process of claim 61 wherein the surface is comprised of stoichiometric tungsten nitride with a (111) preferred orientation.
64. (Previously Presented) The process of claim 61 wherein the surface is comprised of non-stoichiometric tungsten nitride having a greater amount of nitrogen atoms than tungsten atoms contained therein.